

REPRINTED FROM *The Guy's Hospital Gazette*.

---

# ANÆMIA.

BY

J. H. BRYANT, M.D., B.S.

---

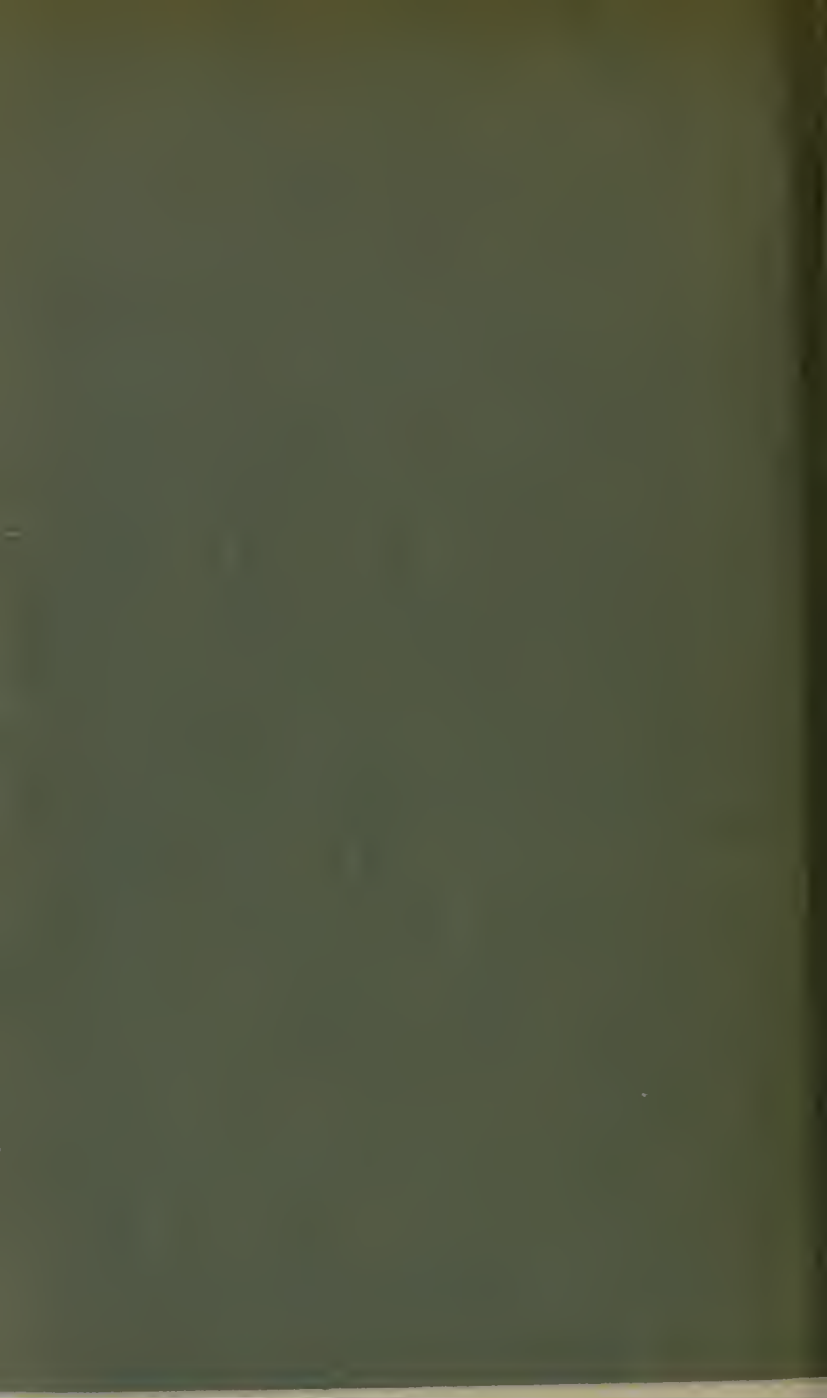
*A Clinical Lecture delivered on May 15th, 1901.*

---

LONDON :

ASH & Co., LTD., Printers, 42, Southwark Street, S.E.

1901.



## ANÆMIA.

---

GENTLEMEN,—Since taking charge of the Clinical wards I have had under my care some interesting cases of Anæmia, the series including examples of pernicious anæmia, chlorosis, splenomedullary leuchæmia, Hodgkin's disease and anæmia secondary to menorrhagia, Bright's disease and plumbism. I propose, therefore, in the first place to discuss with you the differential diagnosis of the various causes of anæmia, to describe to you the characteristic changes which are found in the blood in these different forms of anæmia with special reference to their diagnostic value and, if time allows, to tell you something about the pathology and treatment of these conditions.

I will read you an account of one of the most interesting cases, from the careful notes taken by Mr. Heap, and it will serve as a peg on which to hang the remarks I wish to make to you on the method of arriving at a conclusion as to the nature or cause of the anæmia. You will also see by the results of the blood examinations and the description of the general condition how much the patient has been benefited by the treatment.

Charlotte W., 49, was admitted on April 4th for vomiting, palpitation and pain in the pre-

cordial area. She is married: she has no children; twenty years ago she had a miscarriage. Since last October she had been in Croydon Hospital, and she states that the diagnosis made there was acute dyspepsia. She says she has occasionally suffered from rheumatic pains, but has never been laid up with a definite attack of rheumatic fever. When 19 she was in the Brompton Hospital for consumption, and she states that she was cured, and that since she has had no further lung trouble.

She has had no menstrual period for the last three years. With regard to her present illness, she considers it followed a strain from lifting a heavy bath in October last, for two hours afterwards she suffered from severe pain in the abdomen; vomiting and diarrhœa followed and lasted for several days. Since October she has been able to do very little work on account of the vomiting; sometimes she is sick two or three times a day. She suffers a good deal from flatulence, and says the vomit is abundant, watery and frothy. Pain and palpitation come on with the least excitement or exertion. She has never vomited blood.

*Condition on Admission.*—She was markedly anæmic. The lips were almost colourless and the skin had a peculiar light yellowish tint. The mucous membranes were very pale. There was a little tenderness in the epigastric region and the stomach appeared to be slightly

dilated. There was marked pulsation of the abdominal aorta. The liver and spleen were not enlarged. The pulse was regular. The cardiac impulse was in the fifth left space inside the nipple line. There was no thrill. The cardiac dulness was not increased. There was an apical systolic bruit which could be traced outwards as far as the anterior axillary line. There was another systolic bruit audible in the second right space about half an inch from the right border of the sternum.

The urine was 1012 sp. gr.; there was no albumen or sugar; it did not appear to be abnormally dark.

On April 5th she was not so well; she complained of nausea, weakness and lassitude and was even more anæmic than when admitted; she was ordered—

Liq. Arsenicalis	...	...	℥v.
Ferri et Ammon Cit.	...	...	gr. vi.
Inf. Quassiaë	...	...	ʒi. t.d.s.

On the 10th she was still suffering from the nausea and vomiting. A blood examination was made. The blood flowed freely from a prick in the lobe of the right ear; it was very pale and watery-looking. The red blood corpuscles numbered 650,000 to the cubic millimetre; they were very variable in size and form; the majority appeared to consist of macrocytes; there were, however, a good many microcytes and poikilocytes.

Several nucleated red corpuscles were seen, they were mostly normoblasts, but a few megaloblasts were seen. The percentage of hæmoglobin was 26 (Von Fleischl's hæmoglobinometer). The colour index was therefore 2. The white blood corpuscles numbered 7,000 per cubic millimetre.

The differential count showed—

Polymorphonuclear cells	...	58 per cent.
Small lymphocytes	... ..	30 "
Large "	... ..	9 "
Eosinophiles	... ..	3 "
		<hr/> 100 per cent.

Glycerine extract of bone marrow ʒi., t.d.s. was ordered but soon had to be omitted, as she attributed her subsequent sickness to it.

Her teeth were very carious and there was well marked pyorrhœa alveolaris. This was treated with the frequent application of an antiseptic mouth wash containing myrrh and chinosol. Cultures were taken and microscopical preparations were examined. A large number of bacilli and cocci were found. Some streptococci were found in the cultures. The bacilli were not identified.

On the 13th one minim keratin coated tabloids of creosote were ordered, two being administered three times a day. She had a severe attack of precordial pain, and on examining the heart an early diastolic murmur was heard in the third

left intercostal space close to the border of the sternum. She was ordered—

Liq. Arsenicalis ... .. ℥v.

Inf. Quassiae ... .. ʒj. t.d.s.

instead of the iron and arsenic mixture.

On the 20th she was better and the vomiting and nausea was much less frequent.

On the 25th she was much better and seemed to be less anæmic.

On the 28th her condition was very satisfactory. There was no vomiting and nausea. She was taking her food well, and a blood count showed a great increase in the number of red blood corpuscles, which came out at 2,600,000 per cubic millimetre. The arsenic was increased to seven minims three times a day.

On May 8th she was still feeling and looking much better, she had no nausea and was getting up and taking her food well. She was ordered bone marrow tabloids.

On May the 14th the blood was again examined, with the following result: Red blood corpuscles 1,800,000, white blood corpuscles 5,000, hæmoglobin 41 per cent.

You will see from the account of the case which I have just read, that the most prominent sign of a diseased condition was the marked anæmia. In making a differential diagnosis, the various causes which gave rise to anæmia, with their associated signs and symptoms, must be carefully weighed and considered. Following on the lines of

previous clinical lectures, I shall therefore begin by putting before you a classified list of the most important causes of anæmia.

But first of all as to the meaning of the word anæmia.

It is a term used to denote more than one condition, for the definition includes a diminution in the quality of the blood (oligæmia), or a diminution in the number of corpuscles (oligocythæmia), or in the amount of hæmoglobin (oligochromæmia), or a combination of all three conditions. The pallor which is so characteristic of all anæmic conditions is due to a diminution in the amount of hæmoglobin.

The causes of anæmia may be classified in the following manner, which, however, is quite provisional:—

A. *Primary or essential*, in which there is no obvious cause.

B. *Secondary or symptomatic*, in which the anæmia is the result of loss of blood or is secondary to some definite disease or pathological condition.

A. Primary.

1. Chlorosis.

2. Pernicious anæmia.

B. Secondary or symptomatic.

1. *From actual hæmorrhage.*

Wounds.

Epistaxis.

Hæmatemesis.

Hæmoptysis.



Hæmaturia.  
 Intestinal hæmorrhage.  
 Hæmorrhoids.  
 Uterine hæmorrhages, etc.

2. *Blood diseases.*

Purpura.  
 Scurvy.  
 Hæmophilia.

3. *Parasitic diseases.*

Anchylostomum duodenale.  
 Bilharzia hæmatobia.  
 Bothriocephalus latus.  
 Filaria sanguinis hominis.

4. *Toxic conditions.*

*Inorganic poisons.*

Lead.  
 Mercury.  
 Arsenic, etc.

*Organic.*

Syphilis.  
 Malaria, etc.

5. ? *Other toxic conditions.*

After acute specific fevers.  
 Malignant growths.  
 Tuberculosis.  
 Infective endocarditis.  
 Bright's disease.

6. *From malnutrition, inanition or defective assimilation.*

Starvation.  
 Stricture of the œsophagus.

Carcinoma of the stomach.

Gastric ulcer.

Chronic dyspepsia and gastritis, etc.

7. *Long continued drain of albuminous fluids from the body.*

Discharging sinuses.

Leucorrhœa.

Prolonged lactation, etc.

8. *Certain diseases of the spleen, lymphatic glands and bone marrow.*

Spleno-medullary leuchæmia.

Lymphatic leuchæmia.

Splenic anæmia.

Hodgkin's disease.

I have already mentioned that this classification is a provisional one. I do not claim that it is either perfect or complete. You will, however, find it convenient to have in your mind such a list of classified causes when you have to investigate a case of anæmia with a view to finding out the cause or the nature of it.

I will now proceed to give you some idea as to the manner in which a diagnosis can be arrived at. The investigation may be divided into three stages.

1. The careful analysis of the history of the condition.

2. The careful physical examination of the patient.

3. The examination of the blood.

All possible causes of a secondary anæmia must be carefully excluded before a diagnosis of

chlorosis or pernicious anæmia is made. In some cases the previous history is of great importance, in another case the physical examination of the patient reveals the cause of anæmia, whereas in other cases a correct diagnosis cannot possibly be arrived at until the blood has been carefully and systematically examined.

The history of the condition is of the greatest importance in the diagnosis of those forms of secondary anæmia which are due to a direct loss of blood. In the case I have just related to you there has been no hæmorrhage of any kind, there was nothing suggestive of a primary blood disease, of any parasitic diseases, or of any toxic conditions. The vomiting and pain and wasting were suggestive of malignant disease of the stomach, but it was impossible to arrive at a diagnosis from the history alone.

The result of the careful physical examination did not bear out the view of malignant disease. The liver spleen and kidneys were not palpable. There was a little fulness in the epigastric region which suggested some dilatation of the stomach, but there was no tumour pointing to carcinoma of the pylorus, nor was there evidence of any other form of pyloric obstruction. The examination of the heart revealed the presence of a basal and a mitral bruit, and these bruits in association with the pyrexia and the anæmia were suggestive of infective endocarditis although there was no sign of embolism. There was no sign of any pulmonary trouble and the urine

was healthy, so that phthisis and Bright's disease were excluded. There were no glandular enlargements. The result of the physical examination, therefore, was not in favour of malignant disease, but suggested the possibility of infective endocarditis; it was, thus impossible, even after the physical examination, to arrive at any justifiable conclusion as to the cause of the very marked anæmia.

The result of the blood examination, however, made the diagnosis quite evident, for the changes found were characteristic of pernicious anæmia. In the light of recent investigations on the nature of this disease, it is a question whether it should be classed under the heading primary or idiopathic. Hunter looks upon pernicious anæmia as a disease of septic origin. He states that it is the result of a special infection of the digestive tract, especially of the mucosa of the stomach, and that the mouth and intestine are also frequently affected. He considers that oral sepsis, resulting from cario-necrotic conditions of the teeth, plays an important rôle in its production. One important element of the infection he believes to be streptococcal, but he does not consider it to be entirely streptococcal. It is of interest to note that with other organisms, streptococci were found in the cultures taken from the pus which welled out from around the teeth of the case I have under consideration. The mouths of patients suffering from pernicious anæmia do not always show septic changes.

Dr. Pitt has recently had under his care a patient suffering from pernicious anæmia, and Mr. Maggs who was asked to see the patient remarked that the condition of the mouth and teeth was exceptionally good for a hospital patient. Hunter looks upon vomiting, retching and diarrhoea as local manifestations of the infection. The pyrexia he also interprets as a result of the infective process.

The blood is pale and watery in character, and in extreme conditions it may even be yellowish in colour. It coagulates very slowly and as a rule there is very little, if any, rouleaux formation. The decrease in the number of red blood corpuscles is remarkable, in fact more excessive than in any other known condition. In fifty-two cases examined by Cabot the average was 1,200,000 to the cubic millimetre. The lowest count on record is by Quincke, who records a case in which there were only 143,000 to the cubic millimetre. In the case I have read to you the number was 650,000, which is very low. The form and size of the red blood corpuscles are extremely variable and this is at once seen if a film is examined microscopically, for you would at once be struck with the want of uniformity in the size of these corpuscles. A large number of macrocytes and microcytes may be seen, the former usually in excess of the latter, but seldom constituting more than 12 per cent. of the red corpuscles. The average diameter of a normal red blood corpuscle is  $7.5 \mu$ .

The macrocytes may measure as much as  $20\ \mu$ , their average size is  $10\ \mu$ , microcytes may measure  $5\ \mu$  or even less. In addition to the alteration in size, there is usually marked poikilocytosis or alteration in the shape of the corpuscles, pear, battledore, sausage and horse-shoe shape forms being visible. In a large number of cases nucleated red blood corpuscles are found, and they also vary in number and in size and form. Three varieties are described and they are termed normo-blasts, megaloblasts and micro-blasts.

The normoblasts are of the size of the normal non-nucleated red corpuscles. They usually contain one nucleus but may possess occasionally from two to four. The nucleus stains deeply with nuclear stains and occupies the greater part of the corpuscle. The nucleus stains much deeper than the nuclei of the white corpuscles. Free nuclei may be recognised in the films by their remarkable affinity for nuclear stains. The protoplasm of the normoblast usually presents a pure hæmoglobin colour. The megaloblasts are much larger and are from two to four times the size of normal red blood discs. Their protoplasm is usually lighter in colour. The nuclei are larger than the normoblast nuclei but do not stain so deeply. Very large megaloblasts are called giantoblasts. Microblasts are not usually present in the disease, they may be found in cases of anæmia due to severe hæmorrhage. It

is of importance to note which form predominates, for an excess of megaloblasts over normoblasts indicates a bad prognosis. The number of nucleated red blood corpuscles vary to a marked degree. In Cabot's series of cases the range of variation was from 6 per cubic millimetre to 7,100 per cubic millimetre. In this disease another change may be seen in the red corpuscles, and that is polychromatophil degeneration, *e.g.*, instead of staining red with eosin and hæmatoxylin, the protoplasm is coloured violet, bluish red or even blue. The protoplasm of the nucleated red, especially the megaloblasts, often show this change. This change in the appearance of the staining indicates a degenerative process. Ehrlich states that megaloblasts are never found in traumatic anæmias. They are sometimes found in leuc hæmia but hardly ever, if ever, even in the severest form of secondary anæmia. They are extremely characteristic of pernicious anæmia, and their presence in a severe anæmia has a most important diagnostic significance. In the investigation of a severe case of anæmia they must be most carefully searched for. Normoblasts have not the same significance for they are found in almost all forms of severe anæmia.

The hæmoglobin is usually much reduced in amount, but not as a rule in the same proportion or to the same extent as the red corpuscles. The colour index for each red corpuscle or the

relative value of each red corpuscle for hæmoglobin is usually in excess of normal. Cabot found the average colour index for 39 cases to be 1·04. Hayem's cases varied from ·88 to 1·7, the normal in each case being one. Cabot found in his cases that the average percentage of hæmoglobin was 26 and the average percentage of red corpuscles 24. In the case before us the colour index was exceptionally high, being two (hæmoglobin 26 per cent., red blood corpuscles 13 per cent.)

The specific gravity is lower than normal.

The blood plates are stated by some observers to be diminished, by others to be increased.

The white blood corpuscles are, as a rule, not increased in number. In Cabot's cases the number averaged 4,200 per cubic millimetre. The lymphocytes were increased averaging 45·9 per cent. The eosinophiles are occasionally slightly increased. In the case I have related to you the lymphocytes comprised 39 per cent. of the leucocytes, a percentage considerably higher than normal.

I will now again refer to the blood examination of the case under consideration, and I think you will see that in almost every respect it is characteristic of pernicious anæmia.

First count (April 10th)—

Red blood corpuscles	...	650,000
Hæmoglobin ...	...	26 per cent.
Colour index ...	...	2
White blood corpuscles	...	7,000



Polymorphonuclear cells ...	58 per cent.
Small lymphocytes ...	30 "
Large lymphocytes ..	9 "
Eosinophiles ...	3 "

Second count (May 14th)—

Red blood corpuscles ...	1,800,000
Hæmoglobin ... ..	5,000
White blood corpuscles ...	41 per cent.
Colour index ... ..	1.14

I recently examined a typical case of this disease at present under Dr. Pitt, in Stephen ward, with the following result.

The blood flowed very freely, it was a little paler than normal, and it did not coagulate readily.

Red blood corpuscles 903,846 per cubic mm.

Hæmoglobin ... .. 23 per cent.

Leucocytes ... 3.571 per cubic mm.

Colour index ... 1.25

Small lymphocytes ... 34 per cent.

Large lymphocytes ... 3 "

Polymorphonuclear cells 57 "

Eosinophiles ... .. 6 "

There were many macrocytes and microcytes, chiefly the former. Poikilocytosis was well marked. There were a large number of nucleated red blood corpuscles. I counted 12 whilst enumerating 100 white blood corpuscles. They were in the following proportion:—

Megaloblasts ... ..	7
Normoblasts ... ..	4
Microblast ... ..	1

A third case, seen at my house was a male, æt. 32. Blood very pale.

Red blood corpuscles	...	...	1,650,000
Hæmoglobin	...	...	...28 per cent.
White blood corpuscles...	...	...	3,591

There is one point of very great interest in connection with pernicious anæmia, and that is its similarity, as far as the blood changes are concerned, to some of the anæmias which are due to the presence of intestinal parasites, and I refer in particular to the *anchylostomum duodenale* and the *bothriocephalus latus*. These diseases have been carefully studied by German observers, who have found that even to the high colour index of the red blood corpuscles, the preponderance of megaloblasts amongst the nucleated red blood corpuscles, and the remarkable reduction in the number of red discs, the blood may be compared with that of pernicious anæmia, in fact, to quote Ehrlich and Lazarus, "Severe *bothriocephalus anæmia* may be described as a pernicious anæmia with a known and removable cause."

The diagnosis from pernicious anæmia, therefore, can only be made by finding evidence of the presence of the parasite by a careful examination of the fæces for the ova, and in the case of the *bothriocephalus latus* of segments of the parasite.

Although the condition of the blood in pernicious anæmia and these parasitic diseases

may be identical, there is a marked contrast in the condition of the viscera in fatal cases. In pernicious anæmia a very great excess of iron is found in the liver and spleen; in the anæmias due to the *bothriocephalus latus* and *anchylostomum duodenale* there is no such excess of iron. The fact that the condition of the blood is almost identical in these diseases I consider to be an important point in support of the view that pernicious anæmia is due to a hæmolytic process brought about by a toxic infection of the upper part of the intestinal tract. In pernicious anæmia the blood is destroyed by the toxine and the iron is deposited in the liver and the kidneys, in *bothriocephalus latus* and *anchylostomum duodenale* the blood is abstracted from the upper part of the intestinal tract by the parasites and is made use of by them, so that there is no iron to be carried off to these organs. In one case the blood is destroyed, in the other abstracted, but the change takes place in the same part of the body in both cases.

Chlorosis may be, but is not usually, mistaken for pernicious anæmia, for the changes in the blood in the two diseases are quite different. In a well marked case of chlorosis the blood is pale, very fluid and thin, and rapidly coagulates. The specific gravity is diminished. The hæmoglobin is reduced much more in proportion than the number of red blood corpuscles, so that the colour index is usually a good deal below 1.

The average number of red blood corpuscles in 77 cases examined by Cabot was 4,050,000, and in 63 cases examined by Thayer 4,096,544.

The red blood corpuscles very rarely fall below 3,000,000 to the cubic millimetre. The average percentage of hæmoglobin in Cabot's cases was 41·2 and in Thayer's cases 42·3. The average colour index of Cabot's cases was ·5.

There may be a considerable amount of alteration in the general size and form of the red blood corpuscles. The average diameter of the red corpuscles may be below the normal, *e.g.*, 7 to 6·5  $\mu$ .

Microcytes are usually in excess, but in very severe forms of the disease a large number of macrocytes may be present. Many of the red corpuscles are paler than normal. Nucleated red corpuscles are not usually found, except in severe and advanced cases, and when found they are almost always normoblasts.

The blood plates are increased. The white blood corpuscles are not as a rule increased. In 76 cases examined by Cabot the average number per cubic millimetre was 7,485. Thayer's average was 8,467.

The lymphocytes are often slightly increased and so also are the eosinophiles.

Lorrain Smith states that the actual volume of blood is increased in chlorosis, the apparent loss in hæmoglobin being due almost entirely to an increase in plasma.

I have a typical case of chlorosis under my care at the present time. The patient is a girl, aged 18, who was admitted on April 16th for fainting fits, restlessness and vomiting. She is a pupil teacher and has been under bad hygienic conditions. There has been no loss of blood to account for the anæmia. She was extremely anæmic and dyspnœic on admission.

Hæmic bruits and a bruit de diable were heard. The urine was normal. There was no evidence of primary disease of the lungs, liver, spleen or any other organ. The blood was examined on April 17th; it was very pale and rapidly coagulated.

Red blood corpuscles...	...	3,000,000
Hæmoglobin ...	...	28 per cent.
White blood corpuscles	...	16,000
Small lymphocytes ...	...	23 per cent.
Large lymphocytes ...	...	9 "
Polymorphonuclear cells	...	61 "
Eosinophiles ...	...	6 "
Basophiles ...	...	1 "

She was ordered full diet, with three eggs a day, watercress with her tea, and the following mixture—

R̄ Tr. Nuc. Vom.	...	...	℥v.
Tr. Cinchonæ Co.	...	..	ʒss.
Aq. Chloroformi ad	...	...	ʒi.
And R̄ Ferri Alginati gr. v. in cachet.			

On the 23rd the dose of iron was increased to gr. viii.

On the 27th the blood examination showed—

Red blood corpuscles	...	3,300,000
Hæmoglobin ...	...	35 per cent.
White blood corpuscles	...	9,687

On the 30th she had stomatitis.

On May 10th the blood examination showed —

Red blood corpuscles	...	3,875,000
Hæmoglobin ...	...	50 per cent.
White blood corpuscles	...	12,500

The leucocytosis was accounted for by some suppuration under the nail of her right big toe.

The changes of the blood are characteristic of chlorosis.

There is another form of secondary anæmia which is not infrequently mistaken for pernicious anæmia, and that is the anæmia which results from carcinoma of the stomach. There is an interesting account of the blood changes in carcinoma of the stomach given by Osler and McCrae in their monograph on Diseases of the Stomach. Accurate counts were made in 59 cases. The average number of red blood corpuscles per cubic millimetre was 3,712,186. The highest count was 6,600,000 per cubic millimetre and the lowest 1,168,000. The high count was explained by the presence of persistent vomiting. There was moderate poikilocytosis. Normoblasts were found, but never a typical megaloblast in any of the cases.

In 52 cases the average percentage of hæmoglobin was 49·9.

The average colour index was 0·63. In 29 of the cases there were less than 8,000 white blood corpuscles to the cubic millimetre. The lowest count was 3,300. The highest count was 28,000.

The differential counts showed an average of 81 per cent. of polymorphonuclear cells. In no case was a myelocyte found.

You will see from these careful observations on the blood in carcinoma of the stomach that a careful blood examination should enable you to exclude pernicious anæmia. Note in the anæmia of carcinoma of the stomach the comparatively large number of red blood corpuscles, the reduction of the percentage of hæmoglobin to a lower degree than the percentage diminution of the number of corpuscles, the consequent low colour index and the absence of megalo-blasts.

I have recently had under my care a patient aged seventy-two who was suffering from severe anæmia which was diagnosed as pernicious anæmia.

An abdominal tumour was felt on the left side of the abdomen and was considered to be an enlarged spleen. A blood count at once showed that he was not suffering from pernicious anæmia, *e.g.* :—

Red blood corpuscles 4,400,000 per cubic mm.

Hæmoglobin ... 38 per cent.

White blood corpuscles ... 5,000

Small lymphocytes	...	15 per cent.
Large lymphocytes	...	5 "
Polymorphonuclear cells...	77	"
Eosinophiles	... ..	2 "
Myelocytes	... ..	? 1 "

A physical examination of the abdomen revealed a large tumour on the left side which presented the characteristic features of an enlarged kidney and which I considered to be carcinomatous. Subsequent events show that the tumour is most probably a carcinoma of the colon.

The anæmia produced by direct losses of blood may possibly simulate pernicious anæmia. Mr. Steward and I have an interesting case of this nature in Bright ward at the present time. He is a man, æt. 32, and was sent to me on account of his anæmia, dyspnœa and palpitation. He was very pale indeed and looked as if he was suffering from pernicious anæmia. The blood examination was as follows—

Red blood corpuscles	... ..	2,950,000
Hæmoglobin	... ..	22 per cent.
White blood corpuscles	... ..	12.187
Small lymphocytes	...	12 per cent.
Large lymphocytes	...	9 "
Polymorphonuclear cells	71	"
Eosinophiles	... ..	7 "
Myelocytes	... ..	? 1 "

The large number of leucocytes was probably due to a digestion leucocytosis, and the anæmia



was due to long-continued and severe hæmorrhage from internal hæmorrhoids.

I have under my care in Clinical ward also a case of anæmia secondary to losses of blood. The patient is a woman, æt. 48, who was sent to me as a case of myxœdema. She certainly has the typical appearance of myxœdema, although all the classical signs of the disease are not present. She is markedly anæmic and at first I thought the anæmia was in some way connected with the myxœdema. We, however, found that she had been suffering from severe and prolonged uterine hæmorrhages, and there is little doubt but that the anæmia is the direct effect of these losses of blood. The result of the blood examination was—

Red blood corpuscles 3,435,714 per cubic m.m.

Hæmoglobin ... 45 per cent.

White blood corpuscles ... 7,857

Small lymphocytes .. 12 per cent.

Large lymphocytes ... 10 "

Polymorphonuclear cells 72 "

Eosinophiles ... 6 "

The specific gravity was 1047.

There was marked poikilocytosis and a good many macrocytes and microcytes were seen on examining films.

These two cases show the typical changes which result from direct losses of blood.

Spleno-medullary leuchæmia might at first sight be mistaken for pernicious anæmia,

especially if the spleen happened only to be moderately enlarged. A blood examination, however, would at once make the diagnosis clear.

The blood may be very pale or it may resemble a mixture of pus and blood; it flows and coagulates slowly. The most characteristic feature is the enormous increase in the number of white blood corpuscles and the large proportion of myelocytes present. The red blood corpuscles are diminished in number—in the 34 cases examined by Cabot the average was 3,120,000. The hæmoglobin is reduced in amount in very nearly the same proportion as the red blood corpuscles, so that the colour index is as a rule normal.

Normoblasts and megaloblasts may be present in large numbers. The white blood corpuscles are enormously increased. In Cabot's cases the average was 438,000 to the cubic millimetre, his highest count was 1,072,222 and his lowest 98,000. The average ratio of white to red was 1 to 7, the highest 1 to 2, and the lowest 1 to 200. The normal number of white blood corpuscles to the cubic millimetre is usually 8,000.

The differential count of the white corpuscles showed the presence of a large number of myelocytes with a diminished percentage of lymphocytes and polymorphonuclear cells. Cabot gives as an average—

Myelocytes	...	...	...	37·7
Eosinophiles	...	...	...	4·4
Polymorphonuclear cells	...	...	...	49·2
Lymphocytes	...	...	...	7·6

The enormous percentage of myelocytes is the most characteristic feature of the blood changes in this disease. The blood plates are increased. Charcot Leyden crystals may be also found.

I have recently had a typical case under my care in John ward. The patient is a man, aged thirty. He was admitted on March the 5th for weakness and pain in the left side. He was very sallow and anæmic looking. His spleen was enormously enlarged, the lower border of it reaching to a point midway between the umbilicus and pubes.

Several blood-counts have been made, the first on March 5th.

Red blood corpuscles	...	...	2,803,000
Hæmoglobin	...	...	40 per cent.
White blood corpuscles	...	...	375,000
Myelocytes	...	...	40 per cent.
Lymphocytes	...	...	7 "
Polymorphonuclear cells and eosinophiles	...	...	53 "

On April 6th I examined the blood and the result was as follows :—

Red blood corpuscles	3,000,000 per cubic mm.		
Hæmoglobin	...	...	42 per cent.

White blood corpuscles 300,000 per cubic mm.

Myelocytes ... 43 per cent.

Polymorphonuclear cells 49 "

Lymphocytes, large ... 2 "

Lymphocytes, small ... 2 "

Eosinophiles ... 3 "

Eosinophilic myelocytes 1 "

Lymphatic leuchæmia is a rarer form and is accompanied by enlargement of the lymphatic glands. The spleen may or may not be enlarged but it never reaches the enormous size that is found in the spleno-medullary variety.

The red blood corpuscles are diminished in number; in Cabot's cases the average was 2,730,000.

Nucleated red blood corpuscles are rarely present, a striking contrast to what is found in the spleno-medullary form. The white blood corpuscles are increased in number, but never to the extent that they are in spleno-medullary leuchæmia. In Cabot's cases the average was 141,000. The relation of white to red was 1:40 (1 to 7 in the other form).

The lymphocytes are enormously increased, forming usually over 90 per cent. of the total number of white corpuscles. The average count in five cases of Cabot was—

Lymphocytes ... 95·9 per cent.

Polymorphonuclear cells ... 3·04 "

Myelocytes... ... 0·7 "

Eosinophiles ... 0·36 "

In early cases of Hodgkin's disease the blood is practically normal. There is no possibility of mistaking this disease for pernicious anæmia, the enlargement of the glands being a condition which is not found in pernicious anæmia. In advanced cases the red blood corpuscles are diminished in number and so also is the hæmoglobin, the latter usually showing a much greater diminution than the former, so that the colour index is considerably below 1. A few normoblasts may be found. The leucocytes are not as a rule increased, when increased the polymorphonuclear cells are found to predominate.

The patient who was recently under my care in Clinical was a man, æt. 36. He was admitted for multiple swellings in the groins and axillæ, and for a curious mental condition. There was no marked enlargement of either the liver or the spleen. He appeared to be moderately anæmic. A blood examination showed—

Red blood corpuscles ... 4,000,000

White blood corpuscles ... 12,000

The hæmoglobin was not estimated.

Films did not show any changes in the red or white cells.

I am afraid I have left very little time to talk to you about the treatment. I shall confine myself to the discussion of two points. (1) The treatment of pernicious anæmia with anti-streptococcic serum; (2) The treatment of chlorosis by alginate of iron.

Hunter has recently reported to the Medico-Chirurgical Society a case of pernicious anæmia treated with injections of antistreptococcic serum, and I have already alluded to his views on the nature of this disease. Oral and intestinal antiseptics was carried out and several injections of antistreptococcic serum were given, arsenic being withheld. The result of five weeks' treatment was very striking, there being an increase of 37 per cent. of hæmoglobin and 40 per cent. of red blood corpuscles. The case in Miriam ward has not been treated with the serum but has improved very much with arsenic and creasote, the latter in the form of keratin coated tabloids. The capsules were coated with keratin in order that they might get into the duodenum before being acted on by the digestive fluids. She has not been treated at present with injections of antistreptococcic serum as we wished first of all to gauge the effect of the creasote and arsenic. It is interesting to note that there is an indication for the use of antistreptococcic serum as streptococci have been found in the cultures taken from the pus, which welled up round the teeth when the gums were pressed.

And now with regard to the alginate of iron. Its use in the treatment of anæmia was suggested to me by Dr. Peake. I have found it well tolerated in all kinds of cases. I have never found it cause any gastric disturbance. I have recently treated a case of severe anæmia result-

ing from profuse hæmatemesis due to a gastric ulcer, ten-grain doses in cachets being administered three times a day, and the treatment was commenced three or four days after the cessation of the bleeding. The patient in Miriam ward who suffers from chlorosis has been treated with eight-grain doses three times a day. It can be prescribed in the form of pills, in cachets, or in a mixture if made up with spiritus ammoniæ aromaticus.

The alginate of iron has the property of passing through the stomach unchanged. It is tasteless, it has no astringent action on the intestine, it does not produce constipation, and it has a sedative action on the mucous membrane of the stomach. I consider it a most useful preparation of iron. The formula of Alginate of Iron is  $C_{76}H_{77}Fe_3N_2O_{22}$ . It contains 10.97 per cent. of iron. It is prepared by decomposing ferric chloride with sodium alginate, both being in solution. Alginic acid is a new organic acid which is obtained from algæ.

I have purposely avoided the mention of any names in connection with this preparation of iron, as I cannot allow any laudatory remarks I have made to be used in any way as a trade advertisement. The patient who has been taking this form of iron has improved very much. Her altered appearance for the better, and the increase in the number of red blood corpuscles, and the percentage of hæmoglobin, demonstrate this fact.

I was hoping to have been able to have told you something more about the pathology of these varieties of anæmia, but I see my time is up.

NOTE. — Since delivering this lecture the patient suffering from pernicious anæmia has been treated with injections of antistreptococcic serum. Five cubic centimetres were injected on May 15th, 17th, 20th and 23rd. Another blood examination was made on May 26th, with the following result—

Red blood corpuscles 1,800,000 per cubic m.m.

White blood corpuscles 7,000

Hæmoglobin ... .. 40 per cent.

On the 31st she was sent to a convalescent home. Her general condition was much improved, although the blood-count showed little improvement since the injections were begun. She had no sickness or vomiting. After the first injection she complained of feeling a little unwell and her temperature rose to 100°. On the following day she felt quite well, and the three following injections did not cause her any inconvenience.

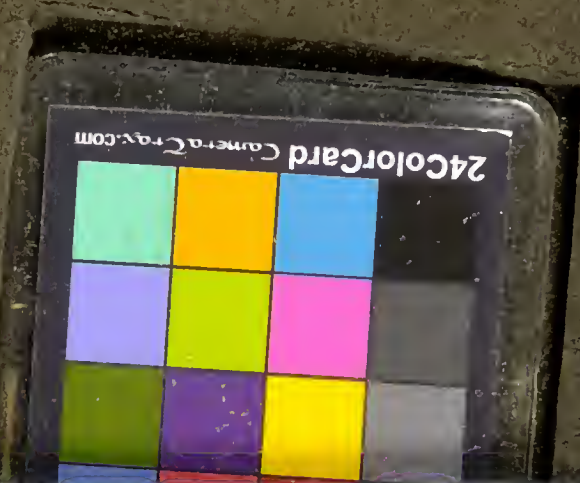
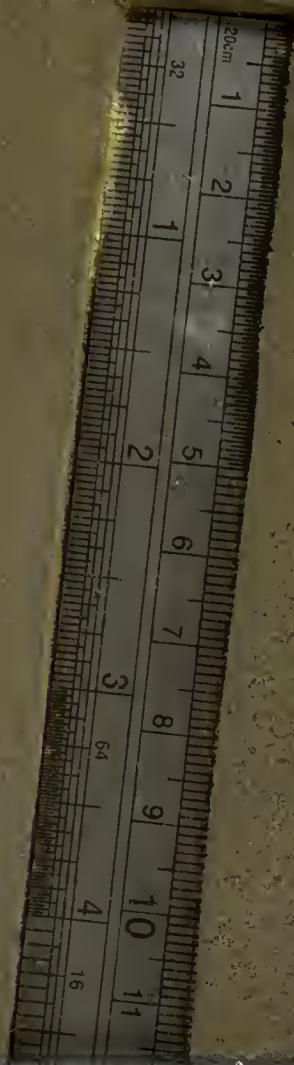
On June 17th I saw at my Out-Patients' the girl who had been under my care in Miriam ward suffering from chlorosis. She had just returned from a convalescent home and was looking the picture of health and stated that she felt perfectly well.











DI/TAP

SOME TIGHT  
GUTTERS

